

4. Assessment of the Shallow-water Flatfish Stock in the Gulf of Alaska

Meaghan D. Bryan

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Executive Summary

Gulf of Alaska shallow-water flatfish (SWF) stock complex includes Alaska plaice (*Pleuronectes quadrituberculatus*), butter sole (*Pleuronectes isolepis*), English sole (*Parophrys vetulus*), sand sole (*Psettichthys melanostictus*), starry flounder (*Platichthys stellatus*), yellowfin sole (*Pleuronectes asper*), northern rock sole (*Lepidopsetta polyxstra*), and southern rock sole (*Lepidopsetta bilineata*). Northern rock sole and southern rock sole are Tier 3 species and are assessed separately from the other shallow-water flatfish, which are Tier 5 stocks. The OFL and ABC for the SWF complex are calculated as the sum of the Tier 3 rock sole assessment values and the Tier 5 other shallow-water flatfish assessment values.

GOA SWF are assessed every 4 years according to the stock assessment prioritization schedule. The random effects model is fit to the AFSC GOA bottom trawl survey for all Tier 5 species to obtain estimates of annual biomass. The ABC and OFL for the Tier 5 stocks are derived as the product of the current biomass and F40% and F35%. The Tier 5 proxy for F40% is assumed to be equal to M (0.2 for all Tier 5 stocks) and the Tier 5 proxy for F35% is 75% of M. The last full assessment was conducted in 2021 (Bryan and Ferriss, 2021), and is available online https://apps-afsc.fisheries.noaa.gov/Plan_Team/2021/GOAshallowflat.pdf. A full stock assessment document with updated assessment and projection model results will be presented in November, 2025.

Description of Updated Catch

Catch data for northern and southern rock sole were updated for harvest projections (see Bryan 2023).

Summary of Results

The recommended ABCs for GOA SWF for 2024 and 2025 are 55,565 t and 56,623 t. The recommended OFLs are 68,121 t and 69,354 t for 2024 and 2025. The values for the entire SWF complex are shown in the table below. Table 1 has a summary of the Tier 3- and Tier 5-specific ABC and OFL values for 2024 and 2025. The projected values for 2024 are similar to those from the previous harvest projections conducted in 2022.

Survey biomass has been generally declining for butter sole, northern rock sole, and yellowfin sole, while English sole has been generally increasing (Figure 1). Exploitation has been variable over time for all species, but has been relatively low for the majority (Figure 2). Butter sole and the rock soles have experienced the greatest exploitation rates in the complex. Overall, exploitation has declined in recent years.

Quantity/Status	As estimated or <i>specified last</i> year for:		As estimated or <i>recommended this</i> year for:	
	2023	2024	2024	2025
M (natural mortality)	0.2**	0.2**	0.2**	0.2**
Tier	3a, 5	3a, 5	3a, 5	3a, 5
Biomass (t)	449,607	452,916	453,606	455,335
FOFL	*	*	*	*
$maxF_{ABC}$	*	*	*	*
F_{ABC}	*	*	*	*
OFL (t)	65,736	68,015	68,121	69,354
$maxABC$ (t)	53,537	55,474	55,565	56,623
ABC (t)	53,537	55,474	55,565	56,623
	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
Status	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a

*Table 1 below provides the specific Tier 3 projection model results for northern and southern and the Tier 5 random effects results for all other shallow-water flatfish.

** Natural mortality for Tier 5 SWF. Table 2 below provides area-specific natural mortality for northern and southern rock sole.

Area Allocation of Harvests

The ABC apportionment by area was estimated by fitting the random effects model to the survey biomass summed for all species (including Tier 3 rock sole) by area and estimating the percent biomass by area. This was done in 2021 and remains unchanged because this was an off-cycle year for the GOA bottom trawl survey (Bryan and Ferriss, 2021).

Proportion	Western	Central	Yakutat	Southeast	Total
	0.42	0.5	0.05	0.03	
2024	23,337	27,783	2,778	1,667	55,565
2025	23,782	28,311	2,831	1,699	56,623

References

Bryan, M.D., Ferriss, B. 2021. Assessment of northern and southern rock sole (*Lepidopsetta polyxstra* and *bilineata*) stocks in the Gulf of Mexico. In: Stock Assessment and Fishery Evaluation Report for Groundfish Resources in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK, USA.

Bryan, M.D. 2023. Assessment of northern and southern rock sole (*Lepidopsetta polyxstra* and *bilineata*) stocks in the Gulf of Mexico. In: Stock Assessment and Fishery Evaluation Report for Groundfish Resources in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK, USA.

Tables

Table 1. ABC and OFL recommendations by species in the GOA shallow-water flatfish stock complex.

Species	Tier	FABC	FOFL	2023 Biomass ¹	2024 Biomass ¹	As specified last year for:				As recommended this year for:			
						2023		2024		2024		2025	
						ABC	OFL	ABC	OFL	ABC	OFL	ABC	OFL
Northern rock sole*	3a	*	*	105,941	105,941	12,722	15,193	13,337	15,924	13,382	15,976	13,799	16,466
Southern rock sole*	3a	*	*	249,461	249,461	26,086	30,903	27,408	32,451	27,454	32,505	28,095	33,248
Yellowfin sole	5	0.15	0.2	24,835	24,835	3,725	4,967	3,725	4,967	3,725	4,967	3,725	4,967
Butter sole	5	0.15	0.2	11,873	11,873	1,781	2,375	1,781	2,375	1,781	2,375	1,781	2,375
Starry flounder	5	0.15	0.2	25,433	25,433	3,814	5,086	3,814	5,086	3,814	5,086	3,814	5,086
English sole	5	0.15	0.2	29,867	29,867	4,480	5,973	4,480	5,973	4,480	5,973	4,480	5,973
Sand sole	5	0.15	0.2	3,000	3,000	450	600	450	600	450	600	450	600
Alaska plaice	5	0.15	0.2	3,196	3,196	479	639	479	639	479	639	479	639
Total ²				453,606	453,606	53,537	65,736	55,474	68,015	55,565	68,121	56,623	69,354

¹ Total biomass (age 0+) estimated from the northern and southern rock sole from the age structured model and the random effects model for Tier 5 species, ² Sum of columns may not equal totals due to rounding, * Biomass, OFL, and ABC estimates are from the summation of area-specific model estimates with species-specific natural mortality (F_{ABC} and F_{OFL} are area-specific, Bryan 2023).

Table 2. Natural mortality for GOA other shallow-water flatfish and area-specific and sex-specific natural mortality for GOA northern and southern rock sole.

Other SWF			
0.2			
Northern Rock Sole		Southern Rock Sole	
WGOA			
Females	0.2	Females	0.2
Males	0.254	Males	0.271
C/E GOA			
Females	0.2	Females	0.2
Males	0.232	males	0.253

Figures

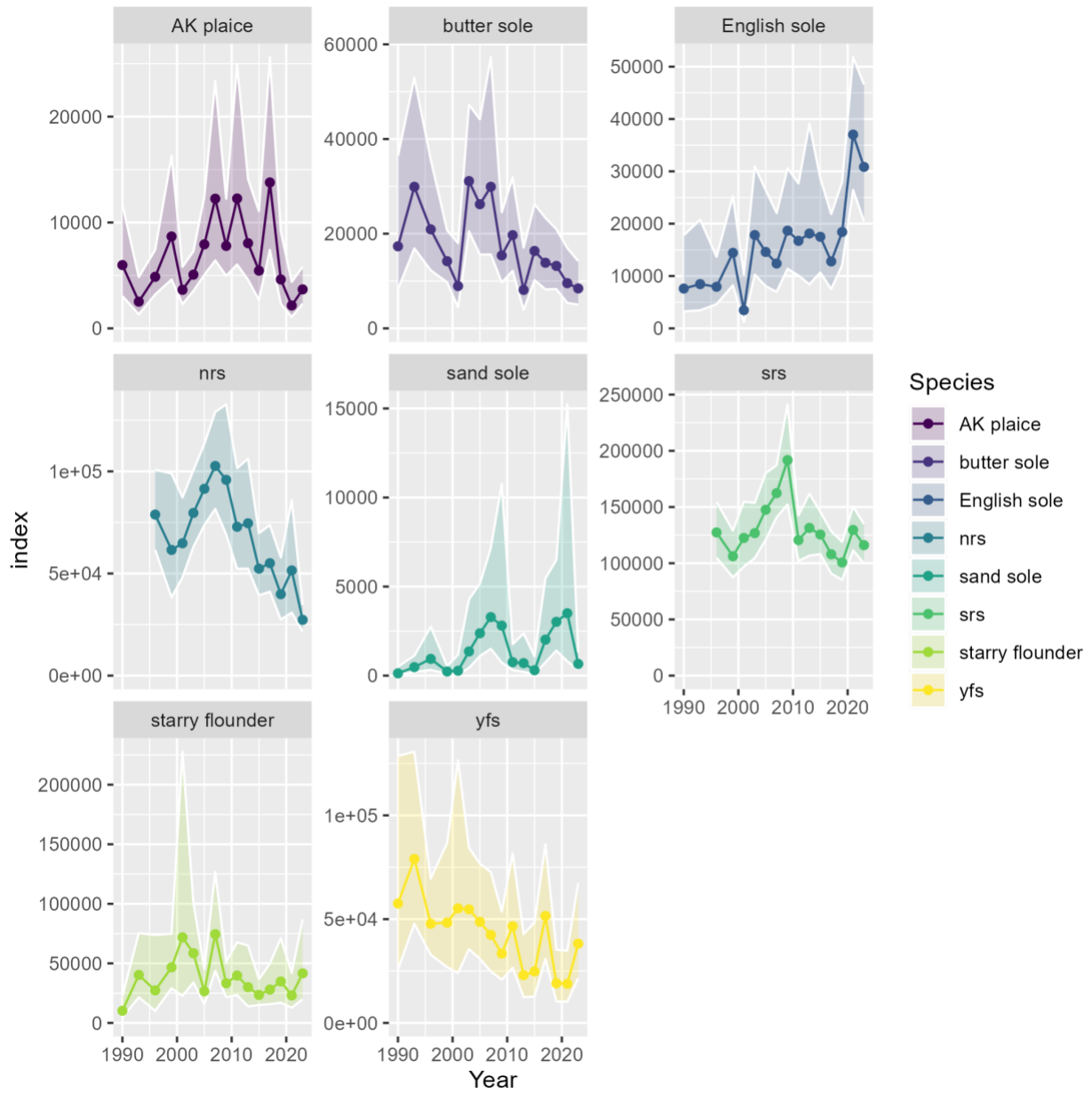


Figure 1. Biomass (t) estimates by species from the AFSC Gulf of Alaska biennial bottom trawl survey, 1990 - 2023, with 95% confidence intervals.

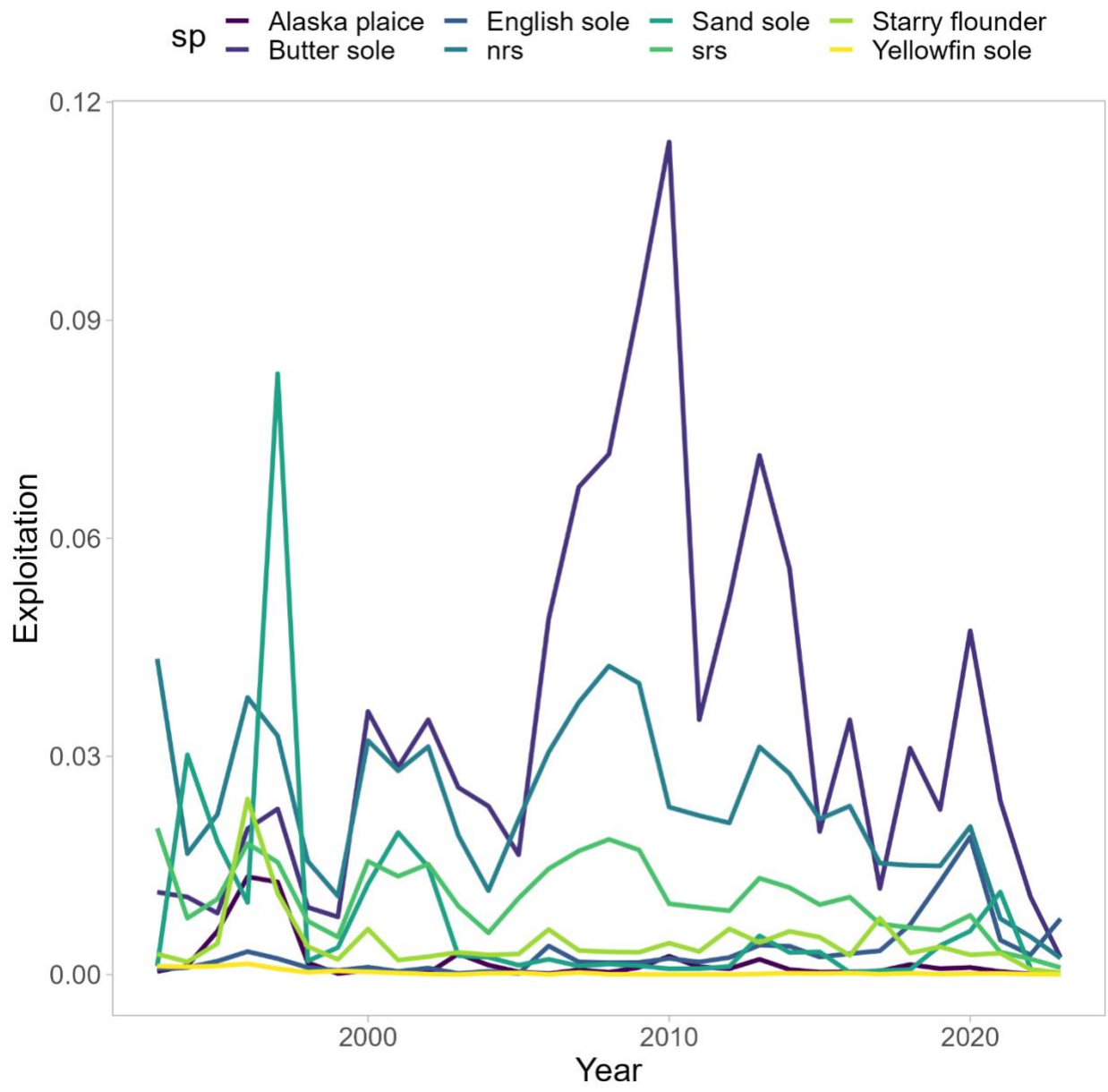


Figure 2. Exploitation (catch / total biomass) by species.